

REMARKS/ARGUMENTS

After entry of the subject amendment, claims 216, 219, 220, 225-228, 233, 236, 238-244, 274-288 remain pending. By way of the present amendment, claims 216 and 244 have been amended, claims 222, 246, 250-255, 257-263, 265, 266, 270, and 273 have been cancelled, and new claims 278-289 have been added.

Prior claims 216, 219, 220, 222, 225-228, 233, 236, 238-244, 246, 250, 253-255, 257-263, 265, 266, 269, 270, and 273-277 were rejected by the Examiner as allegedly being unpatentable over the cited art. Applicants request entry of this amendment and reconsideration of the pending claims given the amendments and remarks made herein.

Double Patenting

Prior claims 216, 219, 220, 222, 225- 226, 228, 233, 238-239, 241-244, 246, 250, 253-255, 258-260, 262, 263, 265, 266, 269, 270, and 273-277 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as allegedly unpatentable over claims 2-8, 10-19, 22, and 24-29 of copending Application No. 11/734,238. Office Action page 2.

Applicants have amended claim 216 to recite a multifocal intraocular lens having near aberration characteristics and far aberration characteristics, each comprising a negative spherical aberration. As amended, claim 216 also recites that these near and far aberration characteristics, when the intraocular lens is in the context of an eye, alter wavefronts passing through the eye from associated near and far viewing distances so as to generate associated near and far MTFs. Lastly, claim 216 specifies that a sum of the near MTF and the far MTF is above 0.5. Support for these novel aspects of the present invention can be found in paragraphs 48-53, 59, 63, 80, 81, and 136, as well as generally throughout the subject application. These highly advantageous aspects of the present invention, however, have not been shown in the cited claims of the '238 application so as to support an obviousness-type double patenting rejection. As all other claims now pending depend from independent claim 216, this rejection is now moot.

Claim Rejections - 35 USC §103

Prior claims 216, 219, 220, 222, 225-228, 233, 236, 238-244, 246, 250, 253-255, 257-263, 265, 266, 269, 270, and 273-277 were rejected under 35 USC §103(a) as allegedly unpatentable over US 5,760,871 in the name of Kosoburd et al. (hereinafter "Kosoburd") in view of US 2002/0122153 in the name of Piers (hereinafter "Piers"). Office Action page 3. Prior claims 216, 219, 220, 222, 225, 227-228, 233, 236, 238-244, 246, 250, 253, 255, 257, 259-263, 265, 266, 269, 270, and 273-277 were rejected under 35 USC §103(a) as allegedly unpatentable over US 5,800,532 in the name of Lieberman (hereinafter "Lieberman") in view of US 2002/0122153 in the name of Piers (hereinafter "Piers"). Office Action page 4. Such rejections are traversed in part (for the reasons stated in Amendments previously filed for this case) and overcome in part.

Applicants have amended independent claim 216 to recite a diffractive intraocular lens providing:

... a base focus and an additional focus, the base focus associated with a far viewing distance and far aberration characteristics, the additional focus comprising the base focus adjusted with a diffractive power of the diffractive pattern, the additional focus associated with a near viewing distance and near aberration characteristics;

the near aberration characteristics of the intraocular lens and the far aberration characteristics of the intraocular lens each comprising a negative spherical aberration defined by at least one of said first shape and said second shape such that when the intraocular lens is in the context of an eye, the eye having a cornea with near aberrations associated with the near viewing distance and far aberrations associated with the far viewing distance, the far aberrations being different than the near aberrations, the intraocular lens mitigates;

a far positive spherical aberration of a wavefront induced by transmitting visible light at 50 cycles/mm from the far viewing distance and

through the cornea, when the wavefront is passing through said intraocular lens,
so as to provide a far modulation transfer function (MTF), and
a near positive spherical aberration of a near wavefront
induced by transmitting visible light at 50 cycles/mm from the near viewing
distance and through the cornea, when the near wavefront is passing through said
intraocular lens, so as to provide a near MTF,
a sum of the far MTF and the near MTF being above 0.5

As explained in the originally filed specification for the subject invention (emphasis added):

[0047] . . . An optical system considered when modeling the lens to compensate for aberrations typically includes the average cornea and said lens, but in the specific case it can also include other optical elements . . .

[0048] In an especially preferred embodiment the bifocal intraocular lens is designed for people who will undergo a cataract surgery. In this case it has been shown that the average cornea from such a population is represented by a prolate surface following the formula . . .

* * *

[0053] In these studies the conic constant of the prolate surface ranges between about -0.05 for an aperture size (pupillary diameter) of 4 mm to about -0.18 for an aperture size of 7 mm. . . .

[0054] In this embodiment, the bifocal intraocular lens is designed to balance the spherical aberration of a cornea that has a Zernike polynomial coefficient representing spherical aberration of the wavefront aberration with a value in the interval from 0.0000698 mm to 0.000871 mm for a 3 mm aperture radius, 0.0000161 mm to 0.00020 mm for a 2 mm aperture radius, 0.0000465 mm to 0.000419 mm for a 2.5 mm aperture radius and 0.0000868 mm to 0.00163 mm for a 3.5 mm aperture radius

* * *

[0059] According to one important aspect, the selection method involves selecting lenses from a kit of lenses having lenses with a range of powers and a plurality of lenses within each power combinations **for far and near foci having different aberrations.** . . .

* * *

[0080] As is shown in the following examples, the bifocal intraocular lens according to the present invention (BRAIOL) **outperforms conventional BIOLs with respect to Modulation Transfer Function characteristics.** More specifically it has been found that the BRAIOL has a modulation of at least 0.2 for both foci at a spatial frequency of 50 cycles per millimetre, when designed such that the light distribution between the two foci is 50:50%. The measurements are performed in an average eyemodel using a 5mm aperture. **Surprisingly it has further been found that the sum of the modulation at 50 c/mm for the two or more foci is more than 0.40, and in some cases even above 0.50,** independent of the light distribution, when measured in the model specified above. The fact that the sum of the modulation at 50 c/mm is independent of light distribution is illustrated for the case where the light distribution has a limiting value of 100:0%, which is equivalent to a monofocal lens. Conventional lenses and lenses correcting spherical aberration were designed, manufactured and measured. In this situation, the conventional lens has a modulation at 50 c/mm of 0.21, while the design optimized for spherical aberration shows a modulation of 0.6, equivalent to the sum of the designed bifocal lens.

[0081] Furthermore, the evaluation experiments have revealed that the wavefronts of the 2 foci of a bifocal lens are independent with respect to some of the Zernike terms, but that some of the Zernike terms are coupled or equal for both. The far majority of this difference is in the 'defocus' term, which

represents the 4 diopters difference between the focal points. In the design process it has been found that the spherical aberration part of the wavefront is not very different for the 2 wavefronts. This is also true for all other aberrations, apart from defocus, tilt and the piston term. Consequently **the present invention makes it possible to provide a lens with reduced aberrations in essentially the same scale for all foci.**

Hence, applicants invention recognizes that the eye has **differing aberration characteristics at differing viewing distances**, with those differing aberration characteristics often being associated with differing pupil sizes. While those characteristics have sufficient overlap to allow use of a single prescriptive lens, specification of the lens characteristics based on a single aberration alone will not provide the benefits available (and now claimed) under the present invention. By instead specifying a lens having asphericity so as to alter near and far wavefronts such that the lens compensates for the differing aberrations of the eye at near and far viewing distances, respectively, the multifocal diffractive intraocular lens provides overall optical performance that was not previously available.

Applicants agree with the Examiner's analysis that neither Kosoburt nor Lieberman disclose the use of an aspheric shape having a negative spherical aberration. [Office Action of January 12, 2010, pp. 4, 5.] Moreover, no reasonable combination of these references with the Piers et al '153 publication will result in the advantageous invention now claimed. Hence, claim 216 (and the claims that depend therefrom) are now in condition for allowance.

The Added Claims

Applicants have added claims 278-289 to more fully claim the present invention. Support for these claims may be found in the originally filed specification in paragraphs 48-53, 59, 63, 80, 81, and 136, as well as generally throughout the text and drawings. No new matter has been added.

Appl. No. 10/724,852
Amdt. dated June 14, 2010
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group

PATENT

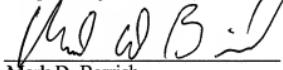
CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

Further, the Commissioner is hereby authorized to charge any additional fees or credit any overpayment in connection with this paper to Deposit Account No. 20-1430.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



Mark D. Barrish
Reg. No. 36,443

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 650-326-2400
Fax: 415-576-0300
Attachments
MDB/is/l1m
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